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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of)
Shunpei YAMAZAKI et al.)
Serial No. 09/233,145) Art Unit: 2871
Filed: January 19, 1999) Examiner: T. Duong
For: ELECTRO-OPTICAL DEVICE)
AND METHOD OF DRIVING)
THE SAME) Date: September 28, 2001

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marsh
10/29/01

PRELIMINARY AMENDMENT

Honorable Commissioner for Patents and Trademarks
Washington, D.C. 20231

Sir:

Please preliminarily amend the subject application as follows:

IN THE CLAIMS:

Please amend claims 2-6, 8-12, 14-18, 20-24, 26-55 as follows: Please note that these are presented below in their amended form. They are further presented as an Attachment to the Amendment whereby the amendments to the claims are outlined using the conventional method of bracketing and underlining.

2. (Amended) A display device according to claim 1 wherein said semiconductor film comprises crystalline silicon.

3. (Amended) A display device according to claim 1 wherein said thin film transistor further comprises a gate electrode located over said semiconductor film with a gate insulating film interposed therebetween.

D1
cont.

4. (Amended) A display device according to claim 1 wherein said organic resin comprises polyimide.

5. (Amended) A display device according to claim 1 wherein said pixel electrode comprises a transparent conductive film.

D2

6. (Twice Amended) A display device according to claim 1 wherein said display is a digital gradation display.

D3

8. (Amended) A display device according to claim 7 wherein said semiconductor film comprises crystalline silicon.

9. (Amended) A display device according to claim 7 wherein said thin film transistor further comprises a gate electrode located over said semiconductor film with a gate insulating film interposed therebetween.

10. (Amended) A display device according to claim 7 wherein said organic resin comprises polyimide.

11. (Amended) A display device according to claim 7 wherein said pixel electrode comprises a transparent conductive film.

D4

12. (Twice Amended) A display device according to claim 7 wherein said display is a digital gradation display.

14. (Amended) A display device according to claim 13 wherein said semiconductor film comprises crystalline silicon.

D5

15. (Amended) A display device according to claim 13 wherein said thin film transistor further comprises a gate electrode located over said semiconductor film with a gate insulating film interposed therebetween.

16. (Amended) A display device according to claim 13 wherein said organic resin comprises polyimide.

D5
cont.

17. (Amended) A display device according to claim 13 wherein said pixel electrode comprises a transparent conductive film.

D6

18. (Twice Amended) A display device according to claim 13 wherein said display is a digital gradation display.

20. (Amended) A display device according to claim 19 wherein said semiconductor film comprises crystalline silicon.

D7

21. (Amended) A display device according to claim 19 wherein said thin film transistor further comprises a gate electrode located over said semiconductor film with a gate insulating film interposed therebetween.

22. (Amended) A display device according to claim 19 wherein said organic resin comprises polyimide.

23. (Amended) A display device according to claim 19 wherein said pixel electrode comprises a transparent conductive film.

D8

24. (Twice Amended) A display device according to claim 19 wherein said display is a digital gradation display.

26. (Amended) A display device according to claim 25 wherein said semiconductor film comprises crystalline silicon.

D9

27. (Amended) A display device according to claim 25 wherein said thin film transistor further comprises a gate electrode located over said semiconductor film with a gate insulating film interposed therebetween.

28. (Amended) A display device according to claim 25 wherein said organic resin comprises polyimide.

29. (Amended) A display device according to claim 25 wherein said pixel electrode comprises a transparent conductive film.

D10

30. (Twice Amended) A display device according to claim 25 wherein said display is a digital gradation display.

31. (Amended) A display device according to claim 1 wherein said display further comprises a tuner for receiving television radio wave to constitute a television.

32. (Amended) A ~~display~~ device according to claim 7 wherein said display further comprises a tuner for receiving television radio wave to constitute a television.

D11

33. (Amended) A display device according to claim 13 wherein said display further comprises a tuner for receiving television radio wave to constitute a television.

34. (Amended) A display device according to claim 19 wherein said display further comprises a tuner for receiving television radio wave to constitute a television.

35. (Amended) A display device according to claim 25 wherein said display further comprises a tuner for receiving television radio wave to constitute a television.

36. (Amended) A display device according to claim 31 wherein said television is a liquid crystal television.

37. (Amended) A ~~display~~ device according to claim 32 wherein said television is a liquid crystal television.

38. (Amended) A display device according to claim 33 wherein said television is a liquid crystal television.

39. (Amended) A display device according to claim 34 wherein said television is a liquid crystal television.

40. (Amended) A display device according to claim 35 wherein said television is a liquid crystal television.

41. (Amended) A display device according to claim 1 wherein said thin film transistor has at least one gate electrode adjacent to said semiconductor film, said gate electrode comprising a material selected from the group consisting of silicon, molybdenum, tungsten, molybdenum silicide, and tungsten silicide.

42. (Amended) A display device according to claim 7 wherein said thin film transistor has at least one gate electrode adjacent to said semiconductor film, said gate electrode comprising a material selected from the group consisting of silicon, molybdenum, tungsten, molybdenum silicide, and tungsten silicide.

43. (Amended) A display device according to claim 13 wherein said thin film transistor has at least one gate electrode adjacent to said semiconductor film, said gate electrode comprising a material selected from the group consisting of silicon, molybdenum, tungsten, molybdenum silicide, and tungsten silicide.

44. (Amended) A display device according to claim 19 wherein said thin film transistor has at least one gate electrode adjacent to said semiconductor film, said gate electrode comprising a material selected from the group consisting of silicon, molybdenum, tungsten, molybdenum silicide, and tungsten silicide.

45. (Amended) A display device according to claim 25 wherein said thin film transistor has at least one gate electrode adjacent to said semiconductor film, said gate electrode comprising a material selected from the group consisting of silicon, molybdenum, tungsten, molybdenum silicide, and tungsten silicide.

46. (Amended) A display device according to claim 1 wherein a liquid crystal material is formed between said substrate and an opposite substrate, said liquid crystal material selected from the group consisting of a twisted nematic liquid crystal, super twisted nematic liquid crystal, ferroelectric liquid crystal, antiferroelectric liquid crystal, dispersion liquid crystal, and polymer liquid crystal.

47. (Amended) A display device according to claim 7 wherein a liquid crystal material is formed between said substrate and an opposite substrate, said liquid crystal material selected from the group consisting of a twisted nematic liquid crystal, super twisted nematic liquid crystal, ferroelectric liquid crystal, antiferroelectric liquid crystal, dispersion liquid crystal, and polymer liquid crystal.

48. (Amended) A display device according to claim 13 wherein a liquid crystal material is formed between said substrate and an opposite substrate, said liquid crystal material selected from the group consisting of a twisted nematic liquid crystal, super twisted nematic liquid crystal, ferroelectric liquid crystal, antiferroelectric liquid crystal, dispersion liquid crystal, and polymer liquid crystal.

49. (Amended) A display device according to claim 19 wherein a liquid crystal material is formed between said substrate and an opposite substrate, said liquid crystal material selected from the group consisting of a twisted nematic liquid crystal, super twisted nematic liquid crystal, ferroelectric liquid crystal, antiferroelectric liquid crystal, dispersion liquid crystal, and polymer liquid crystal.

50. (Amended) A display device according to claim 25 wherein a liquid crystal material is formed between said substrate and an opposite substrate, said liquid crystal material selected from the group consisting of a twisted nematic liquid crystal, super twisted nematic liquid crystal, ferroelectric liquid crystal, antiferroelectric liquid crystal, dispersion liquid crystal, and polymer liquid crystal.

51. (Amended) A display device according to claim 1 wherein said semiconductor film comprises silicon or germanium.

52. (Amended) A ~~display~~ device according to claim 7 wherein said semiconductor film comprises silicon or germanium.

53. (Amended) A display device according to claim 13 wherein said semiconductor film comprises silicon or germanium.

54. (Amended) A display device according to claim 19 wherein said semiconductor film comprises silicon or germanium.

55. (Amended) A display device according to claim 25 wherein said semiconductor film comprises silicon or germanium.

✓✓
Please add new claims 56-130 as follows:

Sub E2 →
56. (New) A display device comprising:
a substrate having an insulating surface;
at least one thin film transistor formed on said insulating surface, said thin film transistor having a semiconductor film comprising silicon as an active layer thereof;
an insulating film comprising an inorganic material formed over said semiconductor film;
a first contact hole in said insulating film;
a wiring formed on said insulating film and electrically connected to said semiconductor film through said first contact hole formed in said insulating film;
a leveling film comprising an organic resin to provide a leveled upper surface over said semiconductor film;
a second opening through said leveling film and said insulating film;
and
a pixel electrode formed over said leveled upper surface and directly connected to said semiconductor film through said second opening,

D12

wherein an edge of said leveling film at a periphery of said second opening is rounded.

57. (New) A display device comprising:

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- a substrate having an insulating surface;
- at least one thin film transistor formed on said insulating surface, said thin film transistor having a semiconductor film comprising silicon as an active layer thereof;
- an insulating film comprising an inorganic material formed over said semiconductor film;
- a wiring formed on said insulating film and electrically connected to said semiconductor film through a contact hole formed in said insulating film;
- a leveling film comprising an organic resin provided over said semiconductor film, said insulating film and said wiring;
- an opening through said leveling film and said insulating film; and
- a pixel electrode formed over said leveling film and directly connected to said semiconductor film through said opening,

wherein a diameter of said opening is larger at an uppermost surface of said leveling film than at a lowermost surface thereof.

58. (New) A display device comprising:

- a substrate having an insulating surface;
- at least one thin film transistor formed on said insulating surface, said thin film transistor having a semiconductor film comprising silicon as an active layer thereof;
- an insulating film over said semiconductor film, said insulating film comprising an inorganic material;
- a leveling film comprising an organic resin formed over said insulating film; and

a pixel electrode formed over said leveling film and directly connected to said semiconductor film through an opening provided in said leveling film,

wherein an edge of said organic resin film at a periphery of said opening is rounded.

59. (New) A display device comprising:

a plurality of thin film transistors formed on an insulating surface, each of said thin film transistors comprising at least a semiconductor film;

an insulating film formed over said semiconductor film, said insulating film comprising an inorganic material;

first opening formed in said insulating film over said semiconductor film;

a leveling layer formed over said insulating film to provide a leveled upper surface, wherein said leveling layer comprises an organic resin and is prevented from directly contacting said semiconductor film by said insulating film;

second opening through said leveling layer and said insulating film over said semiconductor film; and

a pixel electrode formed over said leveled upper surface, said pixel electrode being directly connected to said semiconductor film through said second opening.

60. (New) A display device comprising:

a substrate having an insulating surface;

at least one thin film transistor formed on said insulating surface, said thin film transistor having a semiconductor film comprising silicon as an active layer thereof;

an insulating film comprising an inorganic material formed over said semiconductor film;

a first contact hole formed in said insulating film;
a wiring formed on said insulating film and electrically connected to said semiconductor film through said first contact hole formed in said insulating film;
a leveling film comprising an organic resin to provide a leveled upper surface over said semiconductor film;
a second opening through said leveling film and said insulating film;
and
a pixel electrode formed over said leveled upper surface and directly contacting said semiconductor film through said second opening.

61. (New) A television having a display unit and a tuner for receiving television radio wave, said display unit comprising:

a substrate having an insulating surface;
at least one thin film transistor formed on said insulating surface, said thin film transistor having a semiconductor film comprising silicon as an active layer thereof;
an insulating film comprising an inorganic material formed over said semiconductor film;
a first contact hole in said insulating film;
a wiring formed on said insulating film and electrically connected to said semiconductor film through said first contact hole formed in said insulating film;
a leveling film comprising an organic resin to provide a leveled upper surface over said semiconductor film;
a second opening through said leveling film and said insulating film;
and
a pixel electrode formed over said leveled upper surface and directly connected to said semiconductor film through said second opening,

wherein an edge of said leveling film at a periphery of said second opening is rounded.

62. (New) A television having a display unit and a tuner for receiving television radio wave, said display unit comprising:

a substrate having an insulating surface;

at least one thin film transistor formed on said insulating surface, said thin film transistor having a semiconductor film comprising silicon as an active layer thereof;

an insulating film comprising an inorganic material formed over said semiconductor film;

a wiring formed on said insulating film and electrically connected to said semiconductor film through a contact hole formed in said insulating film;

a leveling film comprising an organic resin provided over said semiconductor film, said insulating film and said wiring;

an opening through said leveling film and said insulating film; and

a pixel electrode formed over said leveling film and directly connected to said semiconductor film through said opening,

wherein a diameter of said opening is larger at an uppermost surface of said leveling film than at a lowermost surface thereof.

63. (New) A television having a display unit and a tuner for receiving television radio wave, said display unit comprising:

a substrate having an insulating surface;

at least one thin film transistor formed on said insulating surface, said thin film transistor having a semiconductor film comprising silicon as an active layer thereof;

an insulating film over said semiconductor film, said insulating film comprising an inorganic material,

a leveling film comprising an organic resin formed over said insulating film; and

a pixel electrode formed over said leveling film and directly connected to said semiconductor film through an opening provided in said leveling film,

wherein an edge of said organic resin film at a periphery of said opening is rounded.

64. (New) A television having a display unit and a tuner for receiving television radio wave, said display unit comprising:

a plurality of thin film transistors formed on an insulating surface, each of said thin film transistors comprising at least a semiconductor film;

an insulating film formed over said semiconductor film, said insulating film comprising an inorganic material;

first opening formed in said insulating film over said semiconductor film;

a leveling layer formed over said insulating film to provide a leveled upper surface, wherein said leveling layer comprises an organic resin and is prevented from directly contacting said semiconductor film by said insulating film;

second opening through said leveling layer and said insulating film over said semiconductor film; and

a pixel electrode formed over said leveled upper surface, said pixel electrode being directly connected to said semiconductor film through said second opening.

65. (New) A television having a display unit and a tuner for receiving television radio wave, said display unit comprising:

a substrate having an insulating surface;

at least one thin film transistor formed on said insulating surface, said thin film transistor having a semiconductor film comprising silicon as an active layer thereof;

an insulating film comprising an inorganic material formed over said semiconductor film;

a first contact hole formed in said insulating film;

a wiring formed on said insulating film and electrically connected to said semiconductor film through said first contact hole formed in said insulating film;

a leveling film comprising an organic resin to provide a leveled upper surface over said semiconductor film;

a second opening through said leveling film and said insulating film;

and

a pixel electrode formed over said leveled upper surface and directly contacting said semiconductor film through said second opening.

66. (New) A display device according to claim 56, wherein said semiconductor film comprises crystalline silicon.

67. (New) A display device according to claim 57, wherein said semiconductor film comprises crystalline silicon.

68. (New) A display device according to claim 58, wherein said semiconductor film comprises crystalline silicon.

69. (New) A display device according to claim 59, wherein said semiconductor film comprises crystalline silicon.

70. (New) A display device according to claim 60, wherein said semiconductor film comprises crystalline silicon.

71. (New) A television according to claim 61, wherein said semiconductor film comprises crystalline silicon.

72. (New) A television according to claim 62, wherein said semiconductor film comprises crystalline silicon.

73. (New) A television according to claim 63, wherein said semiconductor film comprises crystalline silicon.

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74. (New) A television according to claim 64, wherein said semiconductor film comprises crystalline silicon.

75. (New) A television according to claim 65, wherein said semiconductor film comprises crystalline silicon.

76. (New) A display device according to claim 56, wherein said thin film transistor further comprises a gate electrode located over said semiconductor film with a gate insulating film interposed therebetween.

77. (New) A display device according to claim 57, wherein said thin film transistor further comprises a gate electrode located over said semiconductor film with a gate insulating film interposed therebetween.

78. (New) A display device according to claim 58, wherein said thin film transistor further comprises a gate electrode located over said semiconductor film with a gate insulating film interposed therebetween.

79. (New) A display device according to claim 59, wherein said thin film transistor further comprises a gate electrode located over said semiconductor film with a gate insulating film interposed therebetween.

80. (New) A display device according to claim 60, wherein said thin film transistor further comprises a gate electrode located over said semiconductor film with a gate insulating film interposed therebetween.

81. (New) A television according to claim 61, wherein said thin film transistor further comprises a gate electrode located over said semiconductor film with a gate insulating film interposed therebetween.

D12 82. (New) A television according to claim 62, wherein said thin film transistor further comprises a gate electrode located over said semiconductor film with a gate insulating film interposed therebetween.

83. (New) A television according to claim 63, wherein said thin film transistor further comprises a gate electrode located over said semiconductor film with a gate insulating film interposed therebetween.

84. (New) A television according to claim 64, wherein said thin film transistor further comprises a gate electrode located over said semiconductor film with a gate insulating film interposed therebetween.

85. (New) A television according to claim 65, wherein said thin film transistor further comprises a gate electrode located over said semiconductor film with a gate insulating film interposed therebetween.

86. (New) A display device according to claim 56, wherein said organic resin comprises polyimide.

87. (New) A display device according to claim 57, wherein said organic resin comprises polyimide.

88. (New) A display device according to claim 58, wherein said organic resin comprises polyimide.

89. (New) A display device according to claim 59, wherein said organic resin comprises polyimide.

90. (New) A display device according to claim 60, wherein said organic resin comprises polyimide.

91. (New) A television according to claim 61, wherein said organic resin comprises polyimide.

92. (New) A television according to claim 62, wherein said organic resin comprises polyimide.

93. (New) A television according to claim 63, wherein said organic resin comprises polyimide.

94. (New) A television according to claim 64, wherein said organic resin comprises polyimide.

95. (New) A television according to claim 65, wherein said organic resin comprises polyimide.

96. (New) A display device according to claim 56, wherein said pixel electrode comprises a transparent conductive film.

97. (New) A display device according to claim 57, wherein said pixel electrode comprises a transparent conductive film.

98. (New) A display device according to claim 58, wherein said pixel electrode comprises a transparent conductive film.

99. (New) A display device according to claim 59, wherein said pixel electrode comprises a transparent conductive film.

100. (New) A display device according to claim 60, wherein said pixel electrode comprises a transparent conductive film.

101. (New) A television according to claim 61, wherein said pixel electrode comprises a transparent conductive film.

102. (New) A television according to claim 62, wherein said pixel electrode comprises a transparent conductive film.

103. (New) A television according to claim 63, wherein said pixel electrode comprises a transparent conductive film.

104. (New) A television according to claim 64, wherein said pixel electrode comprises a transparent conductive film.

105. (New) A television according to claim 65, wherein said pixel electrode comprises a transparent conductive film.

106. (New) A television according to claim 61, wherein said television is a liquid crystal television.

107. (New) ~~A~~ television according to claim 62, wherein said television is a liquid crystal television.

108. (New) A television according to claim 63, wherein said television is a liquid crystal television.

109. (New) A television according to claim 64, wherein said television is a liquid crystal television.

D 12 110. (New) A television according to claim 65, wherein said television is a liquid crystal television.

111. (New) A display device according to claim 56, wherein a liquid crystal material is formed between said substrate and an opposite substrate, said liquid crystal material selected from the group consisting of a twisted nematic liquid crystal, super twisted nematic liquid crystal, ferroelectric liquid crystal, antiferroelectric liquid crystal, dispersion liquid crystal, and polymer liquid crystal.

112. (New) ~~A~~ display device according to claim 57, wherein a liquid crystal material is formed between said substrate and an opposite substrate, said liquid crystal material selected from the group consisting of a twisted nematic liquid crystal, super twisted nematic liquid crystal, ferroelectric liquid crystal, antiferroelectric liquid crystal, dispersion liquid crystal, and polymer liquid crystal.

113. (New) A display device according to claim 58, wherein a liquid crystal material is formed between said substrate and an opposite substrate, said liquid

crystal material selected from the group consisting of a twisted nematic liquid crystal, super twisted nematic liquid crystal, ferroelectric liquid crystal, antiferroelectric liquid crystal, dispersion liquid crystal, and polymer liquid crystal.

114. (New) A display device according to claim 59, wherein a liquid crystal material is formed between said substrate and an opposite substrate, said liquid crystal material selected from the group consisting of a twisted nematic liquid crystal, super twisted nematic liquid crystal, ferroelectric liquid crystal, antiferroelectric liquid crystal, dispersion liquid crystal, and polymer liquid crystal.

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115. (New) A display device according to claim 60, wherein a liquid crystal material is formed between said substrate and an opposite substrate, said liquid crystal material selected from the group consisting of a twisted nematic liquid crystal, super twisted nematic liquid crystal, ferroelectric liquid crystal, antiferroelectric liquid crystal, dispersion liquid crystal, and polymer liquid crystal.

116. (New) A television according to claim 61, wherein a liquid crystal material is formed between said substrate and an opposite substrate, said liquid crystal material selected from the group consisting of a twisted nematic liquid crystal, super twisted nematic liquid crystal, ferroelectric liquid crystal, antiferroelectric liquid crystal, dispersion liquid crystal, and polymer liquid crystal.

117. (New) A television according to claim 62, wherein a liquid crystal material is formed between said substrate and an opposite substrate, said liquid crystal material selected from the group consisting of a twisted nematic liquid crystal, super twisted nematic liquid crystal, ferroelectric liquid crystal, antiferroelectric liquid crystal, dispersion liquid crystal, and polymer liquid crystal.

118. (New) A television according to claim 63, wherein a liquid crystal material is formed between said substrate and an opposite substrate, said liquid crystal material selected from the group consisting of a twisted nematic liquid crystal, super twisted nematic liquid crystal, ferroelectric liquid crystal, antiferroelectric liquid crystal, dispersion liquid crystal, and polymer liquid crystal.

119. (New) A television according to claim 64, wherein a liquid crystal material is formed between said substrate and an opposite substrate, said liquid crystal material selected from the group consisting of a twisted nematic liquid crystal, super twisted nematic liquid crystal, ferroelectric liquid crystal, antiferroelectric liquid crystal, dispersion liquid crystal, and polymer liquid crystal.

D12 120. (New) A television according to claim 65, wherein a liquid crystal material is formed between said substrate and an opposite substrate, said liquid crystal material selected from the group consisting of a twisted nematic liquid crystal, super twisted nematic liquid crystal, ferroelectric liquid crystal, antiferroelectric liquid crystal, dispersion liquid crystal, and polymer liquid crystal.

121. (New) A display device according to claim 56, wherein said display device is a digital gradation display device.

122. (New) A display device according to claim 57, wherein said display device is a digital gradation display device.

123. (New) A display device according to claim 58, wherein said display device is a digital gradation display device.

124. (New) A display device according to claim 59, wherein said display device is a digital gradation display device.

125. (New) A display device according to claim 60, wherein said display device is a digital gradation display device.

126. (New) A television according to claim 61, wherein said display unit is a digital gradation display device.

127. (New) A television according to claim 62, wherein said display unit is a digital gradation display device.

128. (New) A television according to claim 63, wherein said display unit is a digital gradation display device.

129. (New) A television according to claim 64, wherein said display unit is a digital gradation display device.

130. (New) A television according to claim 65, wherein said display unit is a digital gradation display device.

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cont.